FRYE, GEORGE DANIEL, D.M.A. Musical Accompaniments in the Preparation of Marimba Concerti: A Survey of Selective Interactive Music Software Programs. (2009) Directed by Dr. Randy Kohlenberg. 71 pp.

The purpose of this study was to investigate the features of three interactive music software programs and their application in preparing marimba concerti. Specifically, the study evaluated Finale, NOTION, and SmartMusic for their viability in preparing *Concerto No. 1 in D Minor for Marimba and Orchestra* by Noah Taylor. A review of the literature relating to interactive music software programs revealed a lack of studies examining the use of these types of programs in the preparation of marimba concerti. All three software programs were installed on a 15-inch MacBook Pro computer that met system requirements for all three programs.

Documentation indicated that all three interactive music software programs offered viable alternatives to preparing marimba concerti with piano reductions. Finale and NOTION provided comparable instrument sounds in terms of quantity and quality. Finale improved its instrument sound quality and quantity through its integrated *Garritan Instruments* sound library. NOTION offered improved sound quality and quantity through the purchase of *Sound Expansion Kits*. Finale's Tempo Tap feature and NOTION's NTempo function provided real-time tempo adjustment and the Audio Mixer mechanism for both programs allowed the user to isolate instruments. SmartMusic offered comparable instrument realizations through its SoftSynth device. The program, however, did not offer a tempo control feature that was compatible with marimba. Also,

SmartMusic's export options and Practice Loop feature allowed the user to effectively isolate instruments.

Further research recommendations included empirical studies examining the benefits of interactive music software programs on the preparation of marimba concerti and applying earlier studies performed on the Vivace interactive music software program to current music software programs. Descriptive study recommendations included investigating the applications of interactive music software in the preparation of orchestral percussion excerpts and marimba concertos with wind ensemble, percussion ensemble, or chamber ensemble accompaniments.

MUSICAL ACCOMPANIMENTS IN THE PREPARATION OF MARIMBA

CONCERTI: A SURVEY OF SELECTIVE INTERACTIVE

MUSIC SOFTWARE PROGRAMS

by

George Daniel Frye

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APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of

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ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

On April 29, 1940 Ruth Stuber Jeanne and the Orchestrette Classique premiered

the first known marimba concerto, Paul Creston's *Concertino for Marimba and*

Orchestra, Op. 21.[1] Since the mid-twentieth century, the marimba evolved as a solo

instrument in terms of the number of solo marimbists, the diversity and quantity of

marimba compositions, and the number of recordings of marimba literature. From

technical etudes to unaccompanied and accompanied solos to concerti, the number of

solo marimba compositions increased to well over a thousand.[2]

Common Practices for Preparing Marimba Concerti

Traditionally, marimbists utilized various tools when preparing marimba concerti.

Standard concerto preparation practices for marimbists included engaging in score study,

having discussions with the concerto composer and /or orchestra conductor, watching a

live performance, and listening to a recording of the concerto. Yet hearing live

performances or recordings eluded performers as they prepared marimba concerti.

Daughtrey reported that between 1940 and 2002, marimbists performed197 marimba

concerti with orchestra. Of those 197 performances, 145 orchestras performed the same

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[1] Kathleen Kastner, "Creston, Milhaud, and Kurka: An Examination of the Marimba Concerti," *Percussive Notes* 32, no. 4 (1994): 83.

[2] Steve Weiss Music Print Music Database, https://www.steveweissmusic. com/category/marimba-solo (for accessing solo marimba literature).

five *concerti*.[3] A 2009 review of marimba concerto recordings discovered 31 recordings of 19 marimba concerti with orchestra.[4] The limited number of live marimba concerto performances and marimba concerto recordings reduced the research students and performers completed before performing a concerto.

Traditional marimba concerto preparation methods may limit students and performers in their development of ensemble performance concepts. Practicing with a recording requires students to follow the tempos of the recording. Rehearsing with accompanists playing piano reductions with inherently limited articulation vocabularies requires performers to assume ensemble traits that the piano could not reproduce. Further, rehearsing with accompanists performing piano reductions interferes with developing students' concept of balance and blend with a large ensemble. These shortcomings are due in part to the fact that piano reductions necessarily must omit numerous orchestral parts to render the reduction playable. Preparing marimba concerti by these methods can leave soloists with a false impression of what is happening in the accompanying forces. In addition, preparing marimba concertos by traditional methods can hinder students' conceptual development of ensemble balance and blend, rubato and conducting through gestures, and articulation interpretation.

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[3] Nathan Hunter Daughtrey, "Marimba Concerto Performances in United States Orchestras: 1940 through 2002" (DMA diss., The University of North Carolina at Greensboro, 2004), 41-43.

[4] Search compiled via Amazon.com Audio Recording Database, http://www. amazon.com/s/ref=nb_ss_gw?url=search-alias%3Dpopular&field-keywords=marimba+ concerto&x=0&y=0 (for Marimba Concerto Recordings) and Steve Weiss Music Audio Recordings Database, https://www.steveweissmusic.com/category/classical-percussion-recordings (for Classical Percussion Recordings).

Music Software

In the 1970s and 1980s, music notation programs were created to provide an electronic means for composing music.[5] These programs were based on musical instrument digital interface (MIDI) technology. Developed in 1982, MIDI technology provided a language through which two synthesizers could communicate to one another.[6] Programs utilizing MIDI technology evolved to include computerized music notation editors, performance software programs, and digital audio workstations. In 2009, over 30 music notation programs with features such as integrated sequencers, built-in sound libraries, third-party sound library compatibility, and self-contained synthesizers were available. In addition, a competitive market of audio creation and production software programs, performance software programs, guitar tablature notation programs, marching percussion composition programs, and theory notation programs emerged.[7]

Educators have integrated music software programs into the classroom. Several studies have documented the educational benefits of music software programs. In Ajero's study, group piano students who practiced with the Guide Mode on Yamaha Clavinova keyboards and MIDI accompaniment "demonstrated significantly better improvement in

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[5] Andrew Gerzso, "Paradigms and Computer Music," *Leonardo Music Journal* 2, no. 1 (1992): 75, http://www.jstor.org/stable/1513212.

[6] MIDI Manufacturers Association"Tutorial: History of MIDI," http://www.midi.org/aboutmidi/tut_history. php.

[7] Music123 Software Database, http://www.music123.com/Music-Production-Software-Software,Page-7.Music123?o=5&pgno=1&ipp=24 (for accessing Music Production Software).

total pitch errors in comparison to the control group ($p < .05$)."[8] Similar results were

reached with Orman's study in which students using an interactive multimedia computer

program performed better on written tests ($p < .001$) and on videotape recorded posttests

($p < .001$) than students participating only in a traditional band class.[9]

In 2009, music software programs provided full orchestral sound libraries and

real-time tempo control options that offered a reasonable simulation to a live orchestra.

Additionally, programs of this nature had been used with touring Broadway shows, in

London's West End revival of *Les Misérables*, and with several Cirque du Soleil shows

in Las Vegas where realistic instrument sounds and real-time performance flexibility

were imperative.[10]

Purpose of the Study

Although the number of marimba concerti being composed for orchestra, wind

ensemble, percussion ensemble, and chamber ensemble continues to increase, research

dedicated to the marimba concerto is limited. Therefore, the importance of providing

students, teachers, and performers with a guide to current tools that might make learning

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[8] Mario Ajero, "The Effects of Computer-Assisted Keyboard Technology and MIDI Accompaniments on Group Piano Students' Performance Accuracy and Attitudes," Abstract, *Dissertation Abstracts International,* 68 no. 11A (2007): 4642. http://newfirstsearch.oclc.org/WebZ/FSQUERY?format=BI:next=html/records.html:bad= html/records.html:numrecs=10:sessionid=fsapp4-46402-fv2wfvdd-jir2au:entitypagenum =2:0:searchtype=basic

[9] Evelyn K. Orman, "Effect of Interactive Multimedia Computing on Young Saxophonists' Achievement and Attitude," *Journal of Research in Music Education* 46, no. 1 (1998): 68-69.

[10] Gregory M. Lamb, "Robo-Music Gives Musicians the Jitters," *The Christian Science Monitor*. December 14, 2006, http://www.csmonitor.com/2006/1214/p13s01-almp.html.

and teaching marimba concerti more efficient and effective is critical. Marimbists might benefit from an accompaniment tool that more accurately represents the orchestral instrument sounds, allows for real-time tempo control, and provides for the isolation of instruments or sections of instruments. Accompaniment tools with the aforementioned qualities may better prepare students and performers for what to expect when rehearsing the solo marimba part with the full orchestra.

The purpose of this study was to investigate the features of three interactive music software programs and their application in preparing marimba concerti. Specifically, the study evaluated the music programs Finale, NOTION, and SmartMusic and their use in preparing *Concerto No. 1 in D Minor for Marimba and Orchestra* by Noah Taylor. A lecture-recital demonstrating the accompaniment capabilities of the three programs was presented. Specific research questions addressed in the proposed study were:

1. Can the programs simulate a full range of orchestral instrument sounds?
2. Do the programs offer real-time tempo control?
3. Can the student/performer/teacher isolate instruments for specific group practice situations?

Delimitations

This study was limited to preparing concerti for solo marimba and orchestra. Numerous compositions for solo marimba with wind ensemble or percussion ensemble or chamber ensemble were excluded from the study. In this study, the criteria for the inclusion of the evaluated software programs included:

1. The most widely used programs

2. At least one MIDI-based program
3. At least one non MIDI-based program
4. Programs utilizing contrasting real-time tempo control designs.

Because music software technology advances rapidly, the study limited the review of literature about software to Internet websites, articles, books, and dissertations written since 1994. Due to the widespread use of these programs in music settings, familiarity with either these specific programs or these types of programs was assumed. Therefore, no discussion of note entry or note entry modification was included. Because no detailed MIDI mapping techniques were applied to the files in this study, no discussion of MIDI mapping and its application to sound quality playback was given. Furthermore, much of the study's "technical" discussion was intended for beginning and intermediate music software users.

The second chapter is a review of the research relating to marimba concerto performance practice, and interactive music software programs. Descriptions of selected dissertations and journal articles are provided.

CHAPTER II

REVIEW OF MARIMBA CONCERTO PERFORMANCE PRACTICE LITERATURE

AND INTERACTIVE MUSIC SOFTWARE LITERATURE

The related literature for this study was divided into two groups: studies examining marimba concerto performance practice, and studies examining interactive music software. Studies regarding marimba concerto performance practice focused on specific *concerti*, theory and analysis, performers, composers, technique, and marimba history. One general journal article discussing marimba concerto preparation was found.[11] Studies examining interactive music software were confined to technical advancements in software development and the effects of interactive music software on student performance.

Marimba Concerto Performance Practice Studies

In five dissertations, authors discussed various aspects of specific concerti. In Liao's dissertation, "Ney Rosauro's Two Concerti for Marimba and Orchestra: Analysis, Pedagogy, and Artistic Considerations," an entire chapter was dedicated to performance issues associated with Rosauro's two marimba concertos.[12] The major portion of this

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[11] Steve Rehbein, "Preparing and Performing a Concerto," *Percussive Notes* 33, no. 1 (1995): 49-52.

[12] Wan-Chun Liao, "Ney Rosauro's Two Concerti for Marimba and Orchestra: Analysis, Pedagogy, and Artistic Considerations" (DMA diss., University of Miami, 2005).

chapter was dedicated to technical issues encountered in the solo marimba part. Solo

marimba and orchestra interactions were discussed twice. In her study about the career of

Vida Chenoweth, Phillips provided historical background about on Kurka's *Concerto for*

Marimba and Orchestra that was commissioned and premiered by Chenoweth.[13] Phillips

discussed the marimbist's preparations for performing the Kurka concerto and the

Sarmientos *Concertino for Marimba and Orchestra*. Specific practice routines or

preparation methods, however, were not provided.

The available journal articles on marimba concerti focused on specific concerti

and addressing technical issues in the solo marimba part. Articles analyzing the Rosauro,

Zivkovic, Kurka, Creston, Milhaud, and Ptasynska concerti were available. In his article,

"Preparing and Performing a Marimba Concerto," Rehbein described challenges

marimbists encountered when preparing a marimba concerto, including the potential

trouble spots of "ensemble balance and blend, synchronization in the accompaniment . . .

[and] articulations."[14] Rehbein recommended preparing for a marimba concerto

performance by attempting the following:

> [Obtain] the music and a high-quality recording of the piece (if available) . . . .
> You must also project into the future and imagine performing the piece from the
> concert stage in front of an audience. This process will help you make a necessary
> link or connection with the music where none previously existed . . . . You can
> create the actual performance scenario in your mind by visualizing as many
> elements of the performance (ensemble blend and balance, synchronization in the
> accompaniment, notes and rhythms, dynamics, articulations, creativity, etc.) as

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[13] Laura L. Phillips, "Vida Chenoweth and Her Contributions to Marimba
Performance, Linguistics, and Ethnomusicology" (DMA diss., The University of North
Carolina at Greensboro, 2000).

[14] Rehbein, "Preparing a Concerto," 49.

can be anticipated. This process will help solidify the various musical components and issues that must be accounted for when playing the music.[15]

Interactive Music Software Programs

Descriptive and empirical studies examined new advancements in score following or accompaniment computer systems. Tekin's 2005 study, "An Intelligent Score Following and Accompaniment System for Practice and Rehearsals," described "a new system . . . of providing intelligent accompaniment for students practicing at home."[16] Primarily a description of the new programming designs he proposed, Tekin's new system was for piano study. Three authors performed empirical studies evaluating the impact of an early version music practice software program called "Vivace" on various performance variables. Tseng's study revealed:

> Participants in this study argued that Vivace had helped them learn music better and expedited their performance preparation processes . . . . They acquired stage presence experiences through practicing in simulated performance settings.[17]

Glenn measured the effect of using SmartMusic in applied oboe, clarinet, and bassoon lessons. Results indicated no significant difference in practicing with an intelligent accompaniment ($p = .260$). Posttest scores to a questionnaire indicated, however, that

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[15] Rehbein, "Preparing a Concerto," 49.

[16] Mevlut Evren Tekin, "An Intelligent Score Following and Accompaniment System for Practice and Rehearsals" (DMA diss., Queen's University, 2005).

[17] Shan-Mei Amy Tseng, "Solo Accompaniments in Instrumental Music Education: The Impact of the Computer-Controlled Vivace on Flute Student Practice," PhD diss., University of Illinois at Urbana-Champaign, 1996, Abstract in *Dissertation Abstracts International,* DAI 57, no. 4A (1996): 1536.

students in the experimental group felt that their "overall musicianship improved as a result of practicing with the computer accompaniment."[18]

Multiple authors discussed computer-accompaniment software and its technical specifications, as well as its applications in various educational settings. In their article, Sheldon, Reese, and Grashel examined the effect of digital accompaniments on student instrumental performances. [19] Their research revealed that there was no significant effect of accompaniment groups on music performances ($p = .75$).[20] The researchers maintained, "It cannot be ignored that mean ratings for both accompaniment groups were considerably better than the No Accompaniment group in the initial performance."[21]

Authors at various journals and magazines reviewed Finale, NOTION, and SmartMusic. Although the reviews were redundant, the writers provided information on positive upgrades in the programs and program shortcomings.

Interactive music software studies conducted since 1994 dealt either with advances in programming or the effect of interactive music software on student achievement. Researchers evaluated the effect of interactive music software on student achievement and reported no significant improvements. Furthermore, studies performed

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[18] Susan Germaine Glenn, "The Effects of a Situated Approach to Musical Performance Education on Student Achievement: Practicing With an Artificially Intelligent Computer Accompanist," Ph.D. diss., University of Georgia, 2000, Abstract in *Dissertation Abstracts International,* DAI 61, no. 8A (2000): 3098.

[19] Deborah Sheldon, Sam Reese, and John Grashel, "The Effects of Live Accompaniment, Intelligent Digital Accompaniment, and No Accompaniment on Musicians' Performance Quality," *Journal of Research in Music Education 47* no. 3 (1999): 251-265

[20] Sheldon, "The Effects of Live Accompaniment," 257.

[21] Sheldon, "The Effects of Live Accompaniment," 262.

on early versions of interactive music software identified contributing factors that may have affected study results. Questionnaire results to interactive music software studies revealed subjects' positive impressions of the software and its impact on their achievement.

The existing body of literature dedicated to marimba concerti was limited in scope. All of the studies were historical, biographical, or analytical in nature. In addition, the Creston, Kurka, Milhaud, and Rosauro concertos were popular study topics. Research revealed one journal article dealing specifically with marimba concerto preparation. The lack of descriptive or empirical studies dedicated to pedagogical approaches to preparing marimba concertos identified a need for the study.

Chapter III defines the setup and evaluation parameters for the study. This includes a description of all means of setting up the computer, software, and composition in order to address the three research questions.

CHAPTER III

COMPUTER SETUP, SOFTWARE DETAILS, AND EVALUATION PARAMETERS

The purpose of this study was to investigate the features of three interactive music software programs and their application in preparing marimba concerti. Specifically, the study evaluated the music programs Finale, NOTION, and SmartMusic and their use in preparing *Concerto No. 1 in D Minor for Marimba and Orchestra* by Noah Taylor. Chapter III is divided into four sections. The first section provides details regarding the computer setup and interactive music software. The next three sections correspond with the three research questions: (1) Instrument Realizations, (2) Real-Time Tempo Control, and (3) Instrument Isolation.

Computer Setup and Software Details

- 15-inch MacBook Pro laptop computer
- 2.4 Ghz Intel Core 2 Duo Processor
- 4 GB of RAM memory
- 250 gigabyte hard drive
- 2 NVIDIA graphics processors – GeForce 9400M and GeForce 9600GT
- Finale 2009 installed and updated with most current updates (2009b.r3A)
- NOTION 2.0 installed and updated with most current updates (2.2.0)
- SmartMusic 11.0 installed

All three movements of *Concerto No. 1 in D Minor for Marimba and Orchestra* by Noah Taylor were entered into Finale and NOTION. Portions were entered by hand while other sections were entered through an XML import.

Instrument Realization

Finale's instrument realization capabilities were reviewed using *Garritan Instrument* sounds. NOTION's instrument realization capabilities were evaluated using the default library of sounds and seven add-on sound kits. SmartMusic's instrument realization capabilities were investigated using the program's default SmartMusic SoftSynth player. Movement III from *Concerto No. 1 in D Minor for Marimba and Orchestra* was used to describe each program's instrument realization capabilities.

Real-Time Tempo Control

To describe how Finale, NOTION, and SmartMusic follow the soloist through tempo changes, the second movement of *Concerto No. 1 in D Minor for Marimba and Orchestra* was used. With Finale and NOTION, an accompanist operated the tempo control mechanisms for both programs. Content from Finale and NOTION, including screen shots, were included. SmartMusic's instrument microphone designed for use with the program was purchased, as was the USB microphone adaptor required for Macintosh computers. The microphone was attached to the bar chord in the center of a five-octave Marimba One® marimba. Screen shots of how to set up SmartMusic's Intelligent Accompaniment feature were included.

Instrument Isolation

To document each program's ability to isolate instruments for small group practice, the first movement of *Concerto No. 1 in D Minor for Marimba and Orchestra* was used. Each program's capabilities were reviewed—Finale and NOTION using their

mixer settings, SmartMusic using its Ensemble Accompaniment setting and Practice Loop feature. Screen shots of mixer settings and ensemble accompaniment settings were included.

By documenting the functionality of all three programs regarding instrument realization, real-time tempo adjustment, and instrument isolation, the study was able to identify valid tools useful in the preparation of marimba concerti. In addition, included screen shots and tables provided a limited how-to guide to operating the programs.

The fourth chapter contains a description of how the programs can be used to answer the three research questions. Screen shots, musical examples, and tables are used to support the descriptions.

CHAPTER IV

RESULTS

The purpose of this study was to investigate the features of three interactive music software programs and their application in preparing marimba concerti. Specifically, the study evaluated the music programs Finale, NOTION, and SmartMusic and their use in preparing *Concerto No. 1 in D Minor for Marimba and Orchestra* by Noah Taylor. To determine the viability of the programs, three program features were deemed critical: (1) realistic orchestral sounds, (2) real-time tempo control, and (3) instrument isolation. Chapter IV is organized according to these three areas of focus.

Realistic Orchestral Sounds

By definition, piano reductions reduce the orchestral score to a playable piano arrangement. One potential benefit that interactive music software programs offered was the ability to play back the full orchestral score. Hearing comparable orchestral instrument sounds, however, was an important factor in making interactive music software programs viable in the preparation of marimba concerti.

Finale 2009

Finale offered a broad range of sampled instrument sounds integrated into Finale 2009 (table 1). The program utilized a sound library provided by Garritan Instruments,

TapSpace Virtual Drumline, and Row-Loff Productions. The library included over three hundred instrument sounds integrated into the program. These sounds were in addition to the general MIDI set of sounds that were included with the program. Also, Finale was designed to integrate third-party sound libraries from other software companies for use with Finale 2009. Examples of these libraries included EastWest/Quantum Leap Symphonic Orchestra Gold Complete, Vienna Symphonic Library Symphonic Cube, and Garritan Jazz & Big Band Sounds.

Table 1. List of instruments in Garritan Instruments sound library.

Woodwinds	Brass	Orchestral Strings	Percussion	Percussion	Percussion
Flute Player 1	French Horn Player 1	Violin Player 1	Basic Orch. Perc.	Cymbal Hit (Ping)	Fusion Drum Kit-Splash Cymbal
Flute Player 2	French Horn Player 2	Violin Player 2	Glockenspiel	Alternating Cymbal Hits (Ping)	Fusion Drum Kit-Cowbell
Flute Player 3	French Horn Player 3	Violin Player 3	Marimba	Cymbal Hit (Ping, Choke)	Fusion Drum Kit-Crash Cymbal 2
Flute Solo	French Horn Solo	Violin Solo KS 1	Timpani (left hand hits)	Cymbal Roll (Mod Wheel)	Fusion Drum Kit-Vibraslap
Piccolo Solo	Orch. Trumpet Player 1	Violin Solo KS 2	Timpani (right hand hits)	Cymbal Roll With Release Hit	Fusion Drum Kit-Ride Cymbal 2
Oboe Player 1	Orch. Trumpet Player 2	Violin Solo	Xylophone	Cymbal Roll Crescendo (Recorded)	Fusion Drum Kit-High Bongo
Oboe Player 2	Orch. Trumpet Player 3	Violins KS	Jazz Vibraphone	Marching Cymbals (16 Sounds)	Fusion Drum Kit-Low Bongo
Oboe Player 3	Orch. Trumpet Solo	Violins Arco	Left hand bass drum hit	Fusion Drum Kit-Side Stick	Fusion Drum Kit-Mute High Bongo

Table 1. (*continued*)

Oboe Solo	Jazz Trumpet Open	Violins Pizzicato	Right Hand Bass Drum Hit	Fusion Drum Kit-Bass Drum 1	Fusion Drum Kit-Open High Bongo
English Horn Solo	Jazz Trumpet Straight Mute	Violins Tremolo	Bass Drum Roll	Fusion Drum Kit-Bass Drum 2	Fusion Drum Kit-Low Conga
B-flat Clarinet Player 1	Jazz Trumpet Cup Mute	Viola Player 1	Side Drum Hit Left Hand	Fusion Drum Kit-Rim Shot	Fusion Drum Kit-High Timbale
B-flat Clarinet Player 2	Jazz Trumpet Harmon Mute	Viola Player 2	Side Drum Hit Right Hand	Fusion Drum Kit-Snare LH	Fusion Drum Kit-Low Timbale
B-flat Clarinet Player 3	Jazz Trumpet Bucket Mute	Viola Player 3	Side Drum Roll	Fusion Drum Kit-Snare RH	Fusion Drum Kit-High Agogo
B-flat Clarinet Solo	Band Trumpet Section	Viola Solo KS	Snare Drum Hit Left Hand	Fusion Drum Kit-Closed Hi Hat	Fusion Drum Kit-Low Agogo
Bassoon Player 1	Orch. Trombone Player 1	Viola Solo	Snare Drum Hit Right Hand	Fusion Drum Kit-Low Floor Tom	Fusion Drum Kit-Cabasa
Bassoon Player 2	Orch. Trombone Player 2	Violas KS	Snare Drum Roll	Fusion Drum Kit-Closed Hi Hat LH	Fusion Drum Kit-Maracas
Bassoon Player 3	Orch. Trombone Player 3	Violas Arco	Large Gong	Fusion Drum Kit-Closed Hi Hat RH	Fusion Drum Kit-Short Whistle
Bassoon Solo	Orch. Trombone Solo	Violas Pizzicato	Medium Gong 1	Fusion Drum Kit-Half Open Hi Hat	Fusion Drum Kit-Long Whistle
Contrabassoon Solo	Jazz Trombone Open	Violas Tremolo	Tam Tam	Fusion Drum Kit-Mid Tom	Fusion Drum Kit-Short Guiro
Band Alto Sax. Section	Jazz Trombone Straight Mute	Cello Player 1	Medium Gong 2	Fusion Drum Kit-Open Hi Hat	Fusion Drum Kit-Long Guiro
Jazz Alto Sax.	Jazz Trombone Cup Mute	Cello Player 2	Orchestral Hand Bells	Fusion Drum Kit-Hi Hat Crash	Fusion Drum Kit-Claves
Jazz Tenor Sax.	Jazz Trombone Harmon Mute	Cello Player 3	Piatti Cymbal 1	Fusion Drum Kit-High Tom	Fusion Drum Kit-High Wood Block

Table 1. (*continued*)

Jazz Bari. Sax.	Jazz Trombone Bucket Mute	Cello Solo KS	Piatti Cymbal 2	Fusion Drum Kit-Crash cymbal 1	Fusion Drum Kit-Low Wood Block
	Band Trombone Section	Cello Solo	Piatti Cymbal 3	Fusion Drum Kit-Ride Cymbal 1	Fusion Drum Kit-Mute Cuica
Keyboards	Band Euphonium Section	Cellos KS	Crash Cymbal	Fusion Drum Kit-Ride Cymbal 2	Fusion Drum Kit-Open Cuica
Steinway Piano	Band Mellophone Section	Cellos Arco	Choke cymbal	Fusion Drum Kit-Crash Cymbal 2	Fusion Drum Kit-Mute Triangle
Harpsichord	Band Baritone Section	Cellos Pizzicato		Fusion Drum Kit-Ride Bell 1	Fusion Drum Kit-Open Triangle
Hauptwerk All Stops	Tuba Solo	Cellos Tremolo	**World Instruments**	Fusion Drum Kit-Tambourine	
Vintage Electric Piano	Band Sousaphone Section	Double Bass Player 1	Taiko Drums		
		Double Bass Player 2	Gamelan Ensemble		Marching Percussion Instruments (40 sounds)
Choirs		Double Bass Player 3	Koto		
Choir Ahhs	**Plucked Strings**	Double Bass Solo KS	Balaphon		
Choir Oohs	Harp	Double Bass Solo	Shakuhachi		
	Harp Harmonic	Basses KS	Sitar		
	Acoustic Guitar	Basses Arco			
	Electric Guitar	Basses Pizzicato	Other Ethnic Percussion Instruments (58 sounds)		
	Upright Bass	Basses Tremolo			
	Electric Bass	Full Strings KS			

Table 1. (*continued*)

Full Strings Arco
Full Strings Pizzicato
Full Strings Tremolo

Source: Adapted with permission from the MakeMusic, Inc. website.

NOTION 2.0

NOTION also offered a full range of instruments with their program (table 2). NOTION's instrument sounds were produced by an integrated sound library consisting of sampled instrument sounds recorded by the London Symphony Orchestra at Abbey Road Studios. Since NOTION was not a MIDI-based system, the instrument samples were accessed using an integrated sequencer and playback engine.[22] Additional instrument sounds were available for purchase in Sound Expansion Kits from NOTION.

Table 2. Instrument List for NOTION 2.0.

Woodwinds	Brass	Strings	Percussion	Percussion
Piccolo	French Horn	Violin Section	Timpani	Gong
Flute	Trumpet	Viola Section	Triangle	Tam-Tam
Oboe	Tenor Trombone	Cello Section	Tambourine	Xylophone
English Horn	Bass Trombone	Bass Section	Snare Drum	Glockenspiel/Orch. Bells
Clarinet	Tuba		Suspended	Guiro
			Cymbal	

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[22] Brian Humpherson, "Finale 2008 and NOTION 2.0: From Composition to Performance," *Zone Magazine Music Technology Supplement*, Summer 2008, 35.

Table 2. (*continued*)

Bass Clarinet	Keyboards	Orch. Crash Cymbal	Cabasa
Bassoon	Harp	Bass Drum	Claves
	Piano		
	Celeste		

Source: Adapted with permission from NOTION Music, Inc. website.

A list of Sound Expansion Kits used for this study is provided in table 3. Although NOTION's basic library of sounds appeared to be deceptively small, the list did not show every sample for every instrument. Similarly to the Garritan sounds contained in Finale 2009, each instrument in the NOTION library was recorded multiple times to include notes, dynamics, articulations, and special performance techniques. These instrument sounds, combined with the additional purchased sounds facilitated the soloist's understanding of the solo marimba's role in achieving proper balance and blend with the ensemble.

Table 3. Sound Expansion Kits used for this study.

Sound Kit	Instruments
Expanded Strings I	This kit introduces new techniques for violin, viola, cello, and bass sections, including tremolo, accent tremolo, con sordino, accent con sordino, staccato con sordino, pizzicato con sordino, tremolo con sordino, accent tremolo con sordino, half step trill con sordino, and whole step trill con sordino.
Solo Strings I	This kit introduces solo violin, viola, cello, and double bass. The sounds included for each instrument are legato, accent, staccato, pizzicato, half step trill, and whole step trill, each with a full range of dynamics and articulations.

Table 3. (*continued*)

Expanded Woodwinds	New instruments in this kit are contrabassoon and E-flat piccolo clarinet, each including legato, staccato, accent, and trills, as well as subtone and fluttertongue for piccolo clarinet. Also included are fluttertongue sounds for piccolo, flute, oboe, clarinet, and bass clarinet.
Expanded Brass	This kit introduces euphonium and stopped horn, each with a full range of dynamics and articulations. Also included are fluttertongue and straight mute sounds for horn, trumpet, tenor trombone, bass trombone, euphonium, and tuba. Straight mute techniques included are legato, staccato, accent, trills, and fluttertongue.
Expanded Mallets I	This kit adds marimba, vibraphone, crotales, and chimes. Included are strikes and rolls from a 5-octave marimba and strikes on chimes and crotales. Vibraphone has strikes and rolls with motor off, slow motor speed, fast motor speed, and pedal up/pedal down.
Expanded Percussion I	This kit adds the following instruments: castanets, cowbells, cuckoo, drum sticks, maracas, power toms, ratchet, roto-toms, shakers, sleigh bells, temple blocks, and woodblock. There are also supplementary playing techniques and timbres included for bass drum, cabasa, claves, cymbal, guiro, orchestral crash cymbals, snare drum, suspended cymbal, tambourine, triangle, and whip.
Expanded Percussion II	This kit provides 23 auxiliary percussion instruments: African log drum, almglocken, anvil, bodhrán, bongos, Chinese bo, duck call, flexatone, flower pots, hammer, hand bells, lead pipe, lion's roar, piccolo snare, rainstick, sand blocks, saw, siren whistle, thunder sheet, train whistle, vibrastick, and wind machine.

Source: Adapted with permission from NOTION Music, Inc. website.

SmartMusic

SmartMusic used a self-contained virtual instrument to produce its orchestral instrument sounds. The SmartMusic SoftSynth MIDI device used a sample library consisting of the 128 General MIDI instrument sounds (table 4). Although SmartMusic imported Finale files, the program was unable to process any additional sounds that were assigned to the file.

Table 4. List of Instruments provided by the SmartMusic SoftSynth device

Piano	Chromatic Percussion	Organ	Guitar	Bass
Acoustic Grand	Celesta	Drawbar Organ	Nylon String Guitar	Acoustic Bass
Bright Acoustic	Glockenspiel	Percussive Organ	Steel String Guitar	Electric Bass (finger)
Electric Acoustic	Music Box	Rock Organ	Electric Jazz Guitar	Electric Bass (pick)
Honky-Tonk	Vibraphone	Church Organ	Electric Clean Guitar	Fretless Bass
Electric Piano 1	Marimba	Reed Organ	Electric Muted Guitar	Slap Bass 1
Electric Piano 2	Xylophone	Accordion	Overdriven Guitar	Slap Bass 2
Harpsichord	Tubular Bells	Harmonica	Distortion Guitar	Synth Bass 1
Clavinet	Dulcimer	Tango Accordion	Guitar Harmonics	Synth Bass 2
Solo Strings	**Ensemble**	**Brass**	**Reed**	**Pipe**
Violin	String Ensemble 1	Trumpet	Soprano Sax	Piccolo
Viola	String Ensemble 2	Trombone	Alto Sax	Flute
Cello	SynthStrings 1	Tuba	Tenor Sax	Recorder
Contrabass	SynthStrings 2	Muted Trumpet	Baritone Sax	Pan Flute
Tremolo Strings	Choir Aahs	French Horn	Oboe	Blown Bottle
Pizzicato Strings	Voice Oohs	Brass Section	English Horn	Skakuhachi
Orchestral Strings	Synth Voice	SynthBrass 1	Bassoon	Whistle
Timpani	Orchestra Hit	SynthBrass 2	Clarinet	Ocarina
Synth Lead	**Synth Pad**	**Synth Effects**	**Ethnic**	**Percussive**
Lead 1 (square)	Pad 1 (new age)	FX 1 (rain)	Sitar	Tinkle Bell
Lead 2 (sawtooth)	Pad 2 (warm)	FX 2 (soundtrack)	Banjo	Agogo
Lead 3 (calliope)	Pad 3 (polysynth)	FX 3 (crystal)	Shamisen	Steel Drums
Lead 4 (chiff)	Pad 4 (choir)	FX 4 (atmosphere)	Koto	Woodblock
Lead 5 (charang)	Pad 5 (bowed)	FX 5 (brightness)	Kalimba	Taiko Drum
Lead 6 (voice)	Pad 6 (metallic)	FX 6 (goblins)	Bagpipe	Melodic Tom
Lead 7 (fifths)	Pad 7 (halo)	FX 7 (echoes)	Fiddle	Synth Drum
Lead 8 (bass+lead)	Pad 8 (sweep)	FX 8 (sci-fi)	Shanai	Reverse Cymbal

Table 4. (*continued*)

Sound Effects
Guitar Fret Noise
Breath Noise
Seashore
Bird Tweet
Telephone Ring
Helicopter
Applause
Gunshot

Source: MIDI Manufacturers Association (MMA) website.

<center>Real-Time Tempo Control</center>

Finale 2009

Finale 2009 did not possess a tool whose function was to provide real-time tempo adjustment during performance. The program, however, did provide a feature that functioned in such a capacity. Finale's Tempo Tap feature was designed to allow the user to manually specify tempo changes via MIDI data and Finale's Human Playback feature would interpret that data during playback. The possibility of operating the Tempo Tap tool in real time and accompanying the marimba soloist during the preparation of *Concerto No. 1 in D Minor for Marimba and Orchestra* was available to the user.

Tempo Tap required an additional person to operate the mechanism. To set up the feature, the score was put into Studio View (fig. 1). With the score in Studio View, the Tempo Tap staff was visible. The Tempo Tap staff came pre-loaded with quarter notes in

each measure, but the rhythm was modifiable. For the second movement of *Concerto No. 1 in D Minor for Marimba and Orchestra*, Finale's real-time tempo adjustment capabilities were applied to mm. 21–51. These measures included a rubato section, a tempo change to più mosso, and a tempo change to meno mosso. In m. 21, the Tempo Tap rhythm was adjusted to an eighth-note triplet figure to coordinate with the solo marimba part. To change the rhythm in the Tempo Tap staff, the quarter notes were changed to eighth notes, then to eighth-note triplets. Once the Tempo Tap rhythm was adjusted, the solo marimba part was muted by selecting the mute button for the desired staff in the Audio Mixer controls to the left of each staff (fig. 2).

Figure 1. Studio View of Movement II of *Concerto No. 1 in D Minor for Marimba and Orchestra*

Figure 2. Muting solo marimba part in Movement II

To enable Tempo Tap to control the tempo of the orchestration playback, the score was put into HyperScribe mode. Under the Tools menu, the HyperScribe feature was selected (fig. 3). HyperScribe was activated in m. 21 and the work was performed. During the performance, an accompanist performed the rhythms of the Tempo Tap staff by playing the rhythms with the space bar. Regardless of the rhythms being played in the Tempo Tap staff, the orchestral parts performed their individual rhythms accurately. In addition, as the accompanist made tempo adjustments, the orchestral accompaniment parts adjusted accordingly.
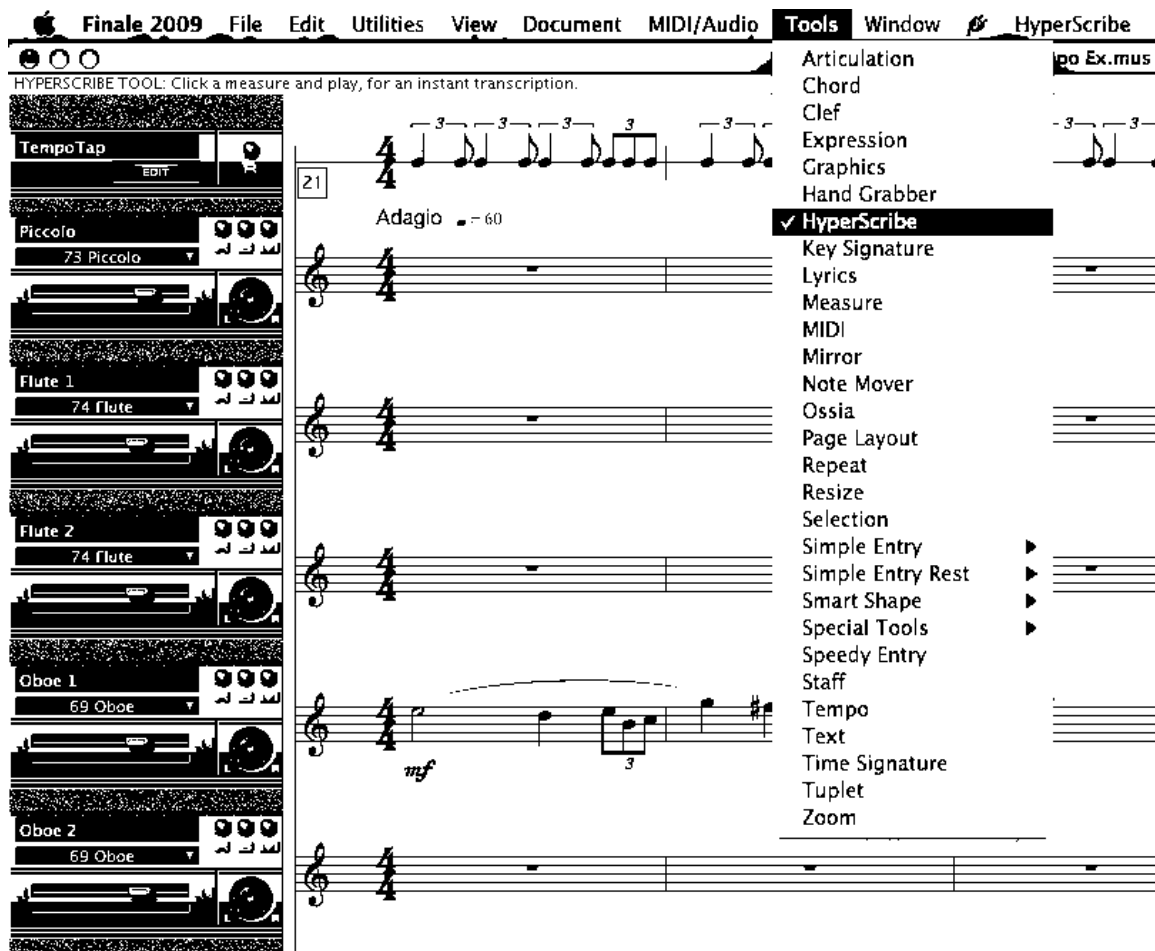
Figure 3. Selecting HyperScribe mode for Movement II

NOTION 2.0

NOTION required a second person to operate the program's real-time tempo

control mechanism. The additional person was needed to "play" the orchestra parts live

and in time with the performer. NOTION's real-time tempo control mechanism, called

NTempo, required the user to create a separate staff for tempo control. With the NTempo

staff, the user notated rhythms for an "accompanist" to perform live. The rhythms were

tailored according to accompanist preferences. To set up and operate the NTempo

feature, several steps were taken.

In step one, an NTempo staff for the second movement of *Concerto No. 1 in D
Minor for Marimba and Orchestra* was created. From the Playback drop-down menu,

Add NTempo Staff was selected (fig. 4). In step two, notes that best enabled the

accompanist to "conduct" the orchestra were added to the NTempo staff. Since the solo

marimba was playing eighth note triplet figures and eighth notes in the melody, eighth

note triplet figures and eighth notes were chosen for the NTempo staff (fig. 5).
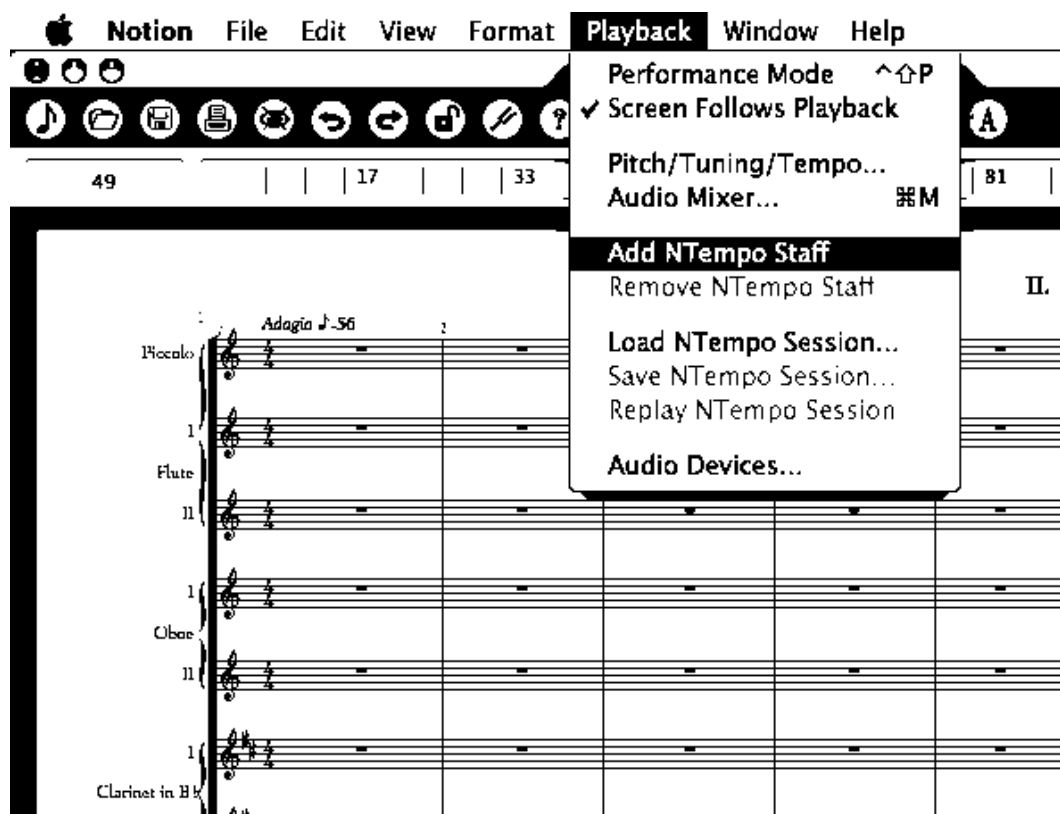

Figure 4. Selecting Add NTempo Staff from Playback drop-down menu in Movement II

In the third step, the solo marimba part and the NTempo staff were muted so they would not play back during the rehearsal (fig. 6). For the final step, the NTempo button was depressed to place the score into *Performance Mode* so the score could be performed live (fig. 7). The NTempo rhythm was performed on any key on the middle row of the keyboard, excluding the caps lock key and the Return key. Although the NTempo track rhythms from mm. 21–29 were different from those of the orchestral accompaniment, the accompaniment parts performed rhythmically accurately (fig. 8).

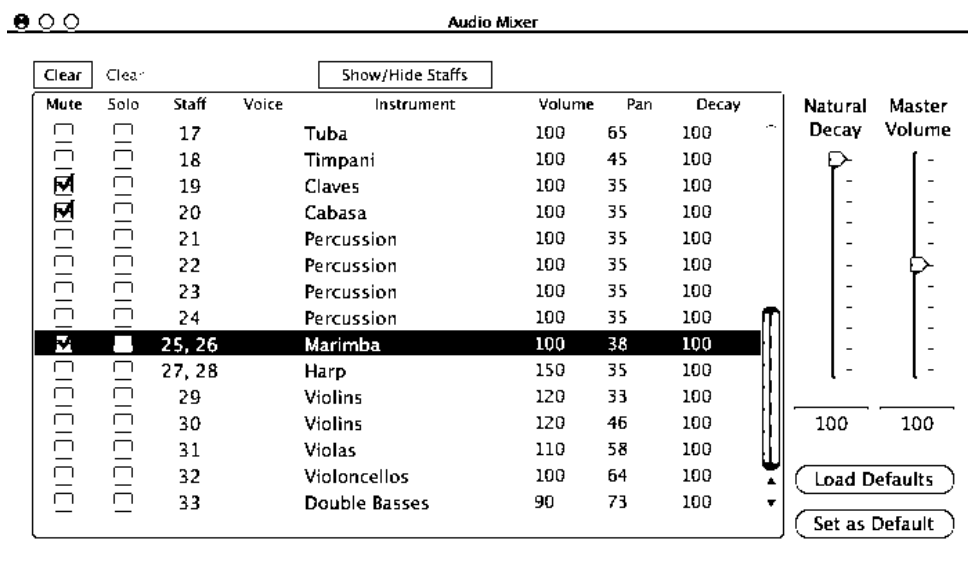**Figure 5.** Notes being added to NTempo staff (top staff) in Movement II

Figure 6. Muting the solo marimba part in Movement II

Figure 7. Pressing NTempo to put Movement II into *Performance Mode*

Figure 8. NTempo staff (top staff) and accompaniment parts in mm. 21–25 of Mvt. II

SmartMusic

    SmartMusic offered an integrated tempo control feature called Intelligent

Accompaniment. According to the MakeMusic, Inc. website:

> Intelligent Accompaniment™ listens as students practice solos and follows their
> spontaneous tempo changes. Slow down and it slows down; speed up and it
> speeds up; set it to wait for a note and it enters when you are done playing a
> rubato section.[23]

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[23] MakeMusic, Inc., "Key Features: Intelligent Accompaniment,"
http://www.smartmusic.com/SmartMusic/Features/IntelligentAccompaniment.aspx.

As promising as this feature appeared, however, the manufacturer suggested "other instruments (such as percussion, guitar, etc.) can use SmartMusic, but simply aren't able to utilize the interactive features including assessment, and Intelligent Accompaniment."[24] The Intelligent Accompaniment feature was tested to see if it worked with marimba. The solo marimba part in the second movement of *Concerto No. 1 in D Minor* was adjusted to a single-staff, single-line part. In preparation for exporting the file to SmartMusic, the Solo Accompaniment was selected and trombone and oboe were selected as possible solo instrument choices to substitute for marimba. The Intelligent Accompaniment sensitivity setting was set at eight, nine, and ten on consecutive tests, yet none of these adjustments enabled the feature to work properly. SmartMusic was not able to provide real-time tempo adjustments in this study.

<div align="center">Instrument Isolation</div>

Finale 2009

Finale 2009 provided instrument isolation via its Mixer feature. To manipulate the Mixer, the user chose from two methods. In Method one, the user enabled the View drop-down menu and activated the Studio View button (fig. 9). In this view, the user interacted with the individual Mixer controls available to the left of each staff. Two buttons on the Mixer allowed the user either to mute or solo the staff. For rehearsing mm. 12–20, the marimbist marked the string instruments as solo instruments (fig. 10). In the second method for accessing the Mixer controls, the marimbist placed the score in Page View,

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[24] MakeMusic, Inc., "Find Answers: Instruments Supported by SmartMusic," http://smartmusic.custhelp.com/app/answers/.

enabled the Window drop-down menu, and activated the Mixer from this list (fig. 11).

Upon activating the Mixer, the Mixer controls for every instrument were visible at the

bottom of the screen. The marimbist marked the string instruments as solo instruments

(fig. 12).
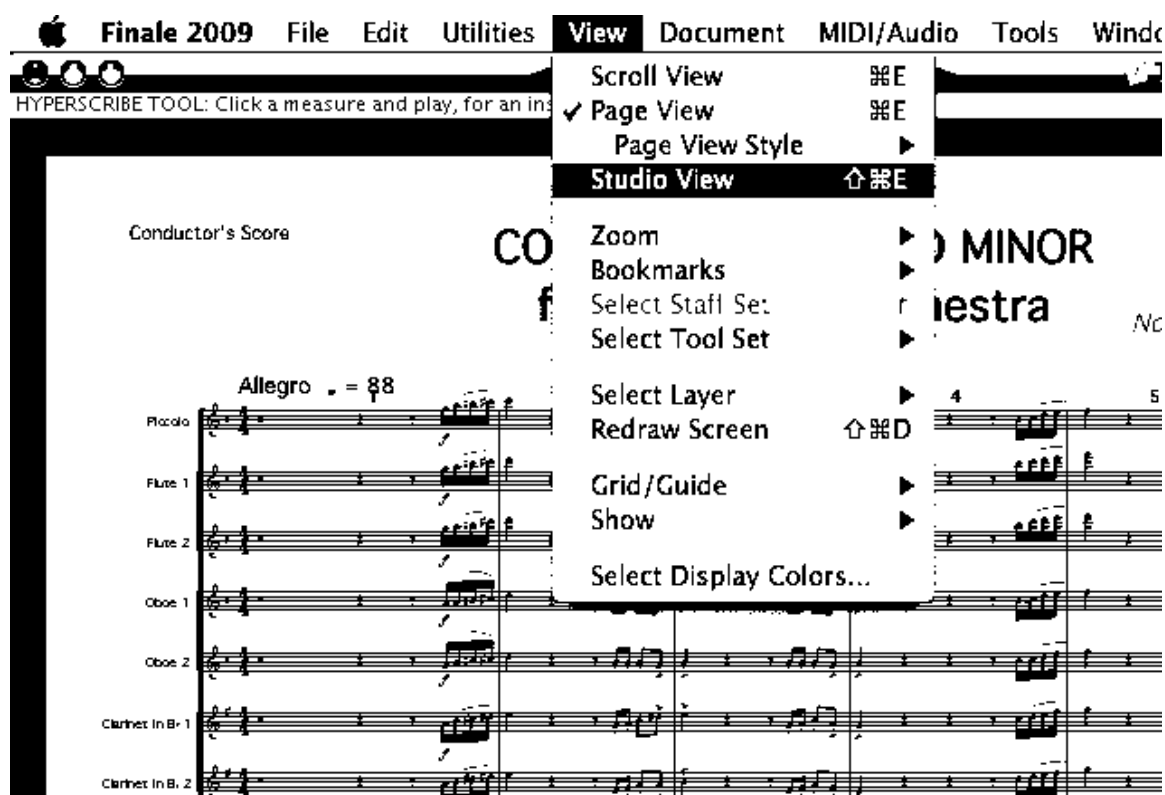
Figure 9. Putting Movement I into Studio View

Figure 10. Marking the string parts as solo parts in Movement I

Figure 11. Activating the Mixer from the Window drop-down menu
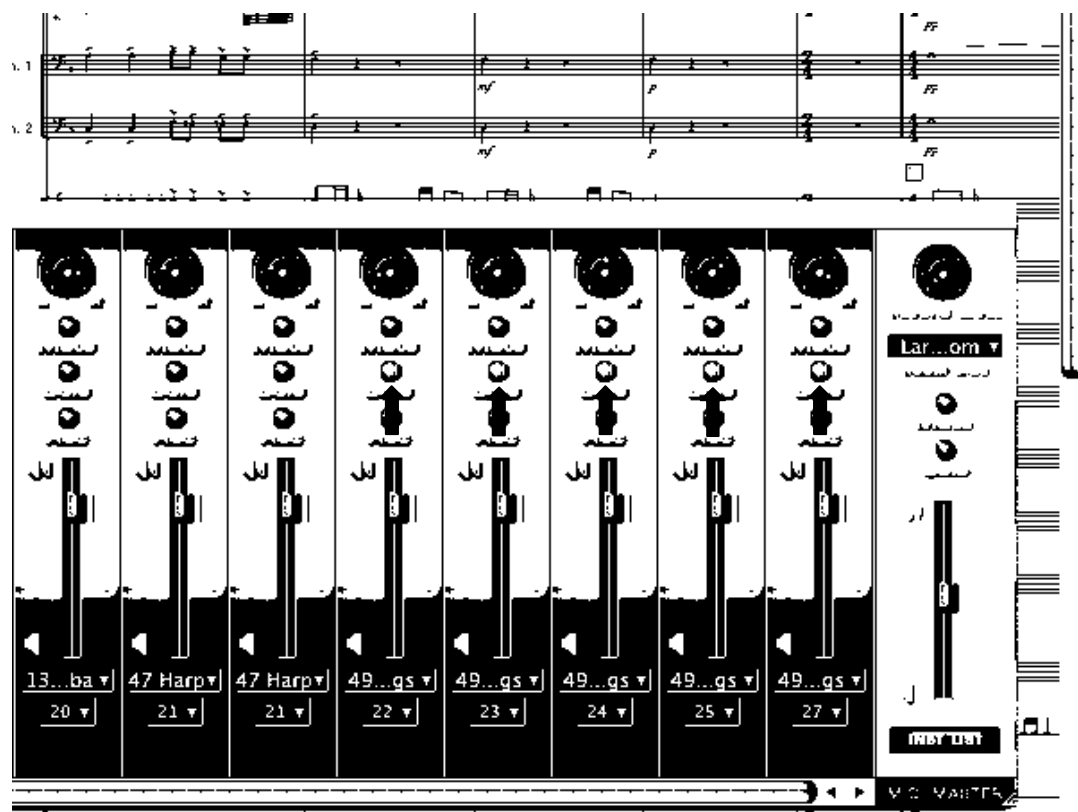
Figure 12. Mixer in Page View and marking the string instruments as solo instruments in Movement II.

Finale 2009 also was able to provide a limited practice loop. To initiate the practice loop, the user activated the Window drop-down menu and opened the Playback Controls panel (fig. 13). The Playback Controls panel was accessed in both Page View and Studio View. In the Playback Controls panel, the marimbist depressed the small arrow in the bottom left corner of the window and set the *Playback Region* to the desired rehearsal section, mm. 12/beat 1–20/beat 2 (fig. 14). Ending the *Playback Region* on beat two of measure 20 allowed the marimbist to complete the phrase that preceded measure 20. In addition, under the *Click and Countoff* button, the marimbist set a one-measure

countoff. The countoff measure played four quarter notes to notify the performer of the tempo of the rehearsal section, providing the performer with one measure to prepare before beginning the rehearsal section. The marimbist depressed the play button in the Playback Controls dialogue box and the rehearsal section performed and repeated as desired.
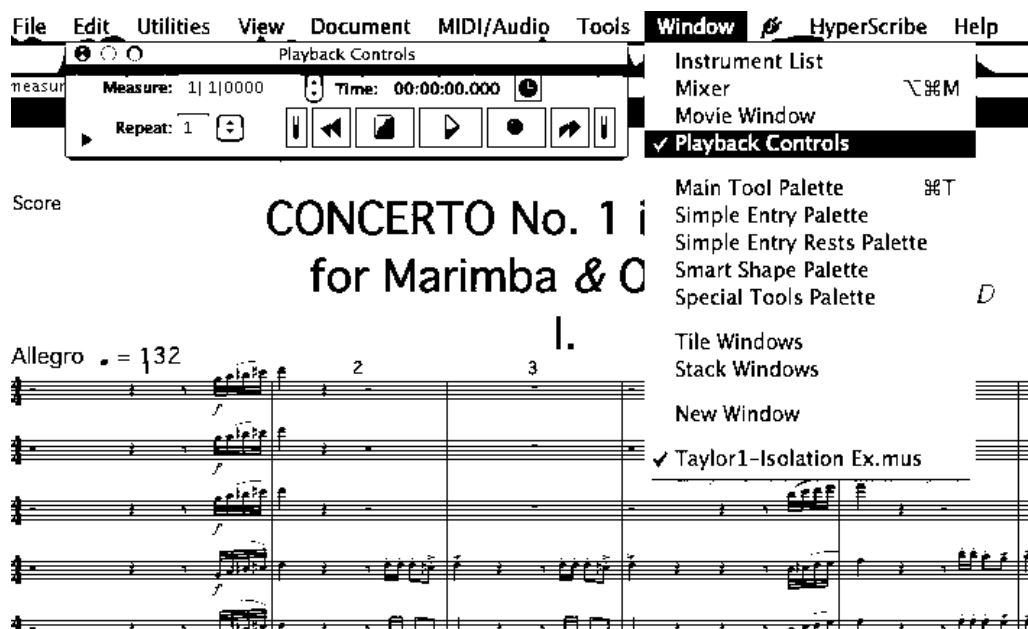
Figure 13. Activating Playback Controls from Page View
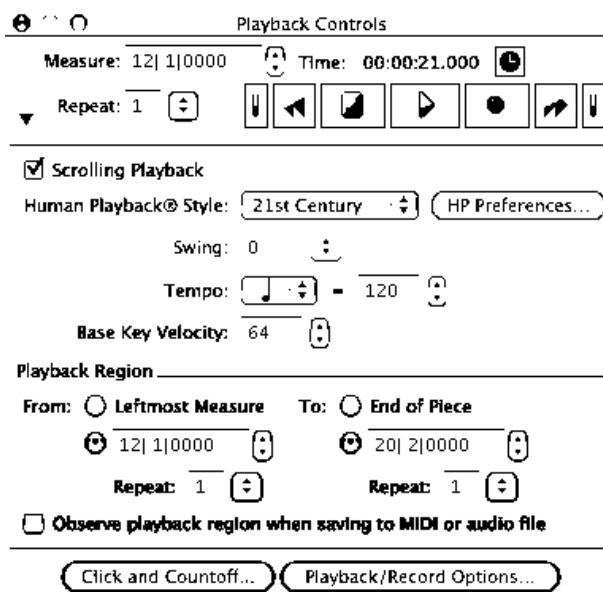
Figure 14. Playback Controls menu for Rehearsal Section mm. 12–20

NOTION 2.0

NOTION provided instrument isolation via its Audio Mixer settings. With the score open, the user opened the Audio Mixer by pressing Command-M. Also, the Audio Mixer was accessible through the Playback drop-down menu by activating the Audio Mixer selection (fig. 15). With the Audio Mixer opened, the marimbist chose the desired instruments with which to rehearse. The user chose the most efficient way to isolate instruments by selecting the desired instruments as solo instruments. For the rehearsal section including mm. 12–20, the marimbist marked the string instruments as Solo (fig. 16).
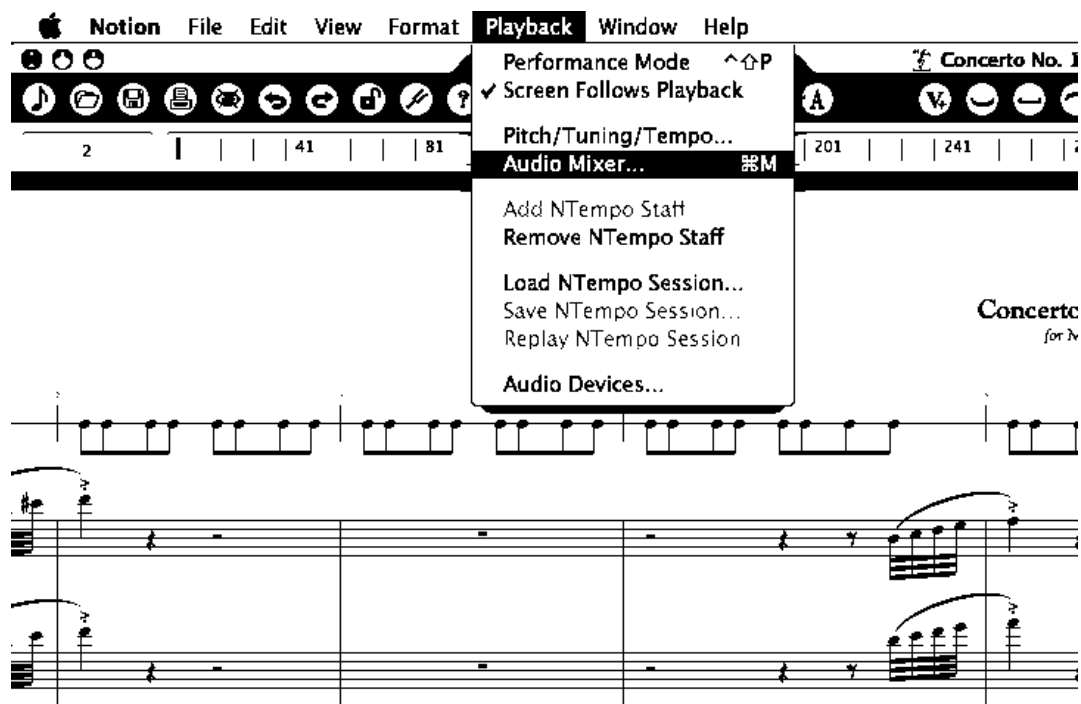
Figure 15. Activating the Audio Mixer from the Playback drop-down menu
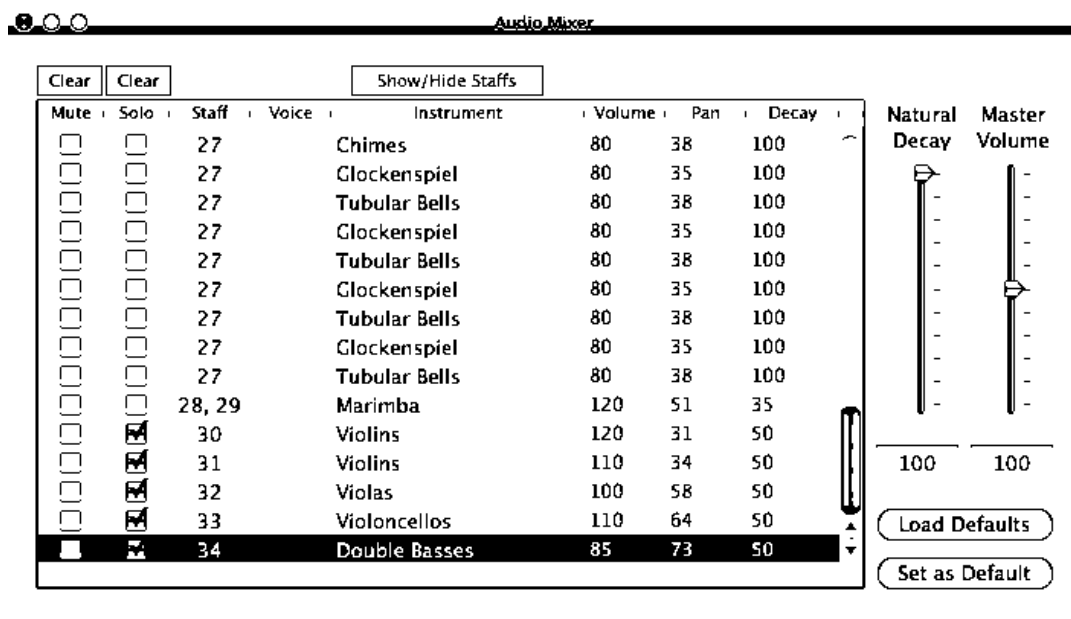
Figure 16. Marking the string instruments as solo instruments in the Audio Mixer

A practice loop was established when the marimbist performed a series of commands. First, the marimbist pressed Command-G or Ctrl-G to activate the Go-To feature and set the beginning of the loop. Both keystroke combinations allowed the user to go to a particular measure. For the aforementioned rehearsal section, the user set the score to go to measure ten (fig. 17). Starting in measure ten created a natural two-measure count off for the rehearsal section beginning in measure twelve. To stop the playback at the end of the rehearsal section (m. 20), the marimbist pressed the Escape key. To start the rehearsal section over in measure ten, the Play button was depressed. The marimbist established a new rehearsal section in mm. 27–33. The marimbist marked all string instruments, French horns, and trombones as solo instruments.

Go To

⊖ Measure Number
○ Rehearsal Number   10

(Close)   (OK)
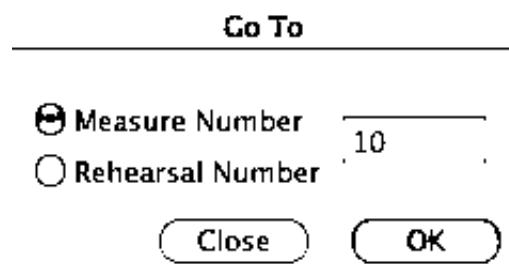
Figure 17. Command-G (Go-To) command screen

SmartMusic

SmartMusic allowed for instrument isolation by utilizing its Ensemble Accompaniment feature. Under the File menu, the marimbist exported Movement I of *Concerto No. 1 in D Minor for Marimba and Orchestra* to SmartMusic as an Ensemble Accompaniment (fig. 18). In the process of exporting the first movement, the user

selected all of the instruments, except for the solo marimba, as accompaniment

instruments (fig. 19). The final step included providing the file with a title. Once the file

was exported to SmartMusic as an Ensemble Accompaniment, the marimbist isolated the

instruments as desired. To accomplish this, the user adjusted the Instrumentation settings.

From the SmartMusic main screen, the marimbist accessed the Find Music and Music

Library menus (fig. 20). The user accessed the *Finale Created Files* database and opened

the exported Movement I file (fig. 21). The rehearsal goal for mm. 12–20 was to

reinforce rhythmic accuracy between the solo part and string parts. Therefore, after the

Instrumentation menu was selected, the marimbist deselected all other instruments as

accompaniment instruments, leaving only the strings as the accompaniment to rehearse

mm. 12–20 (fig. 22).
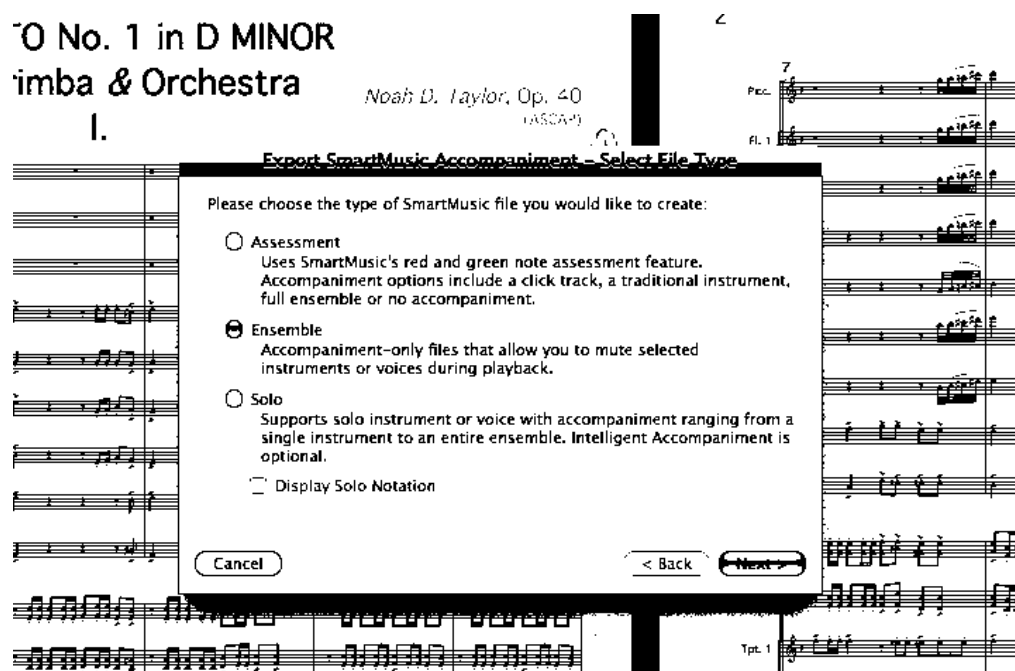
Figure 18. Exporting Movement I as an Ensemble Accompaniment—step 1

Export SmartMusic Accompaniment – Select Accompaniment Staves

Select Accompaniment Staves:

- ☐ Check All
- ☐ Solo Marimba
- ☑ Harp
- ☑ Piccolo
- ☑ Flute 1
- ☑ Flute 2
- ☑ Oboe 1
- ☑ Oboe 2
- ☑ Clarinet in Bb 1
- ☑ Clarinet in Bb 2
- ☑ Bassoon 1

(Cancel)   (< Back) (Next >)
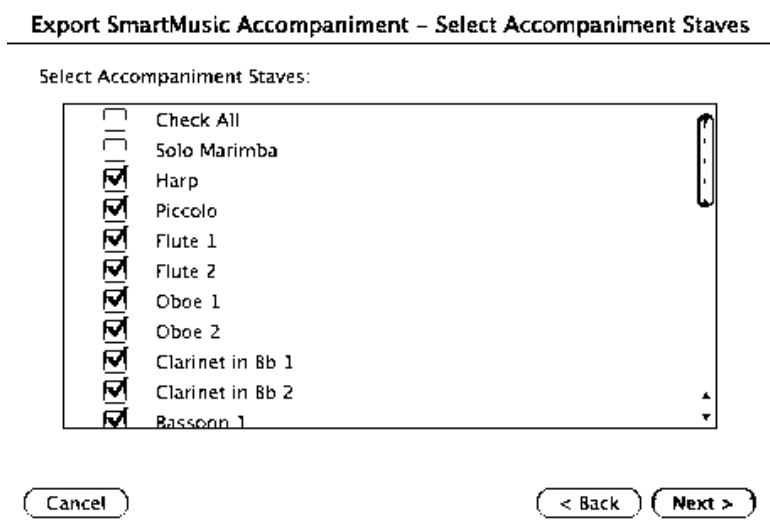
Figure 19. Selecting accompaniment instruments during export process.
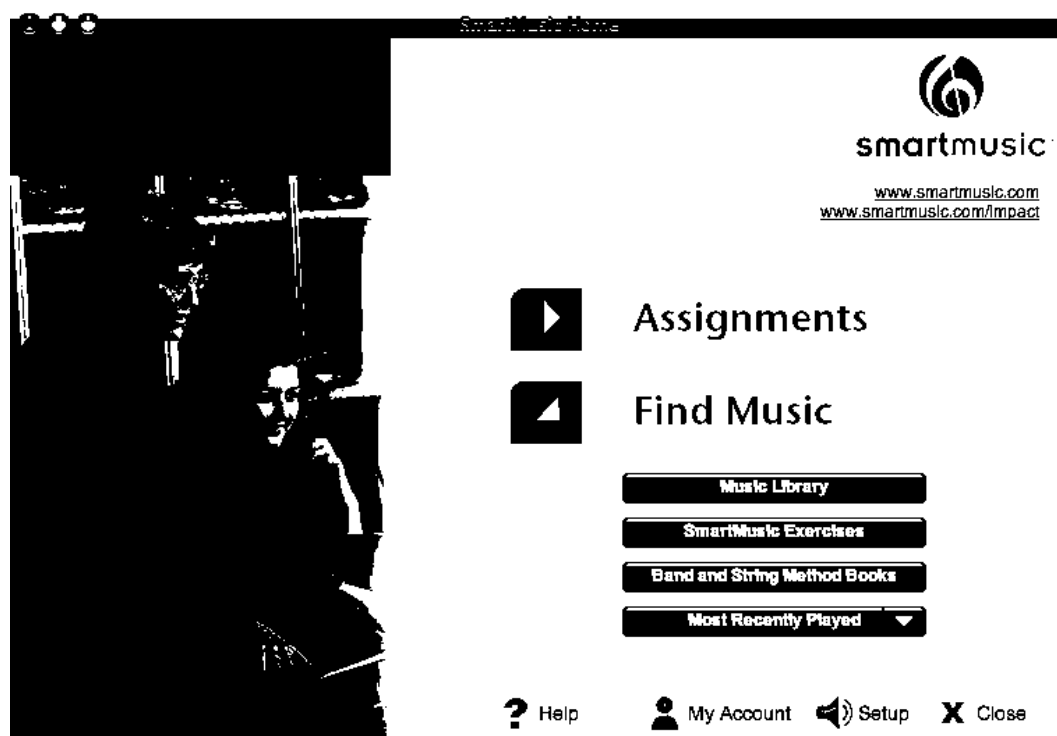
Figure 20. Accessing the Music Library menu from the SmartMusic main screen

/List   Assessment   Subscription   Assignment   Help

| SmartMusic Subscription Files | Method Books | Finale® Created Files | Audio Files |

Type		Filename
Solo	Concerto – Single line Oboe (12–73)	Taylor 3–Edit–3.smp
Ensemble	Concerto – Ensemble Accompaniment	Taylor Single Line Ensemble.smp
Ensemble	Concerto No. 1 in D Minor – Ensemble	Taylor1–Ensemble Edit.smp
Ensemble	Concerto No. 1 in D Minor	Taylor1.1.smp
Ensemble	Concerto No. 1 in D Minor	Taylor1.smp
Solo	Concerto – Mvt. 2 Single Line –3 (mm...	Taylor2–Edit 3.smp
Solo	Concerto – Mvt. 2 Single Line –4 (mm...	Taylor2–Edit 4.smp
Solo	Concerto – Mvt. 2 Single Line –5 (mm...	Taylor2–Edit 5.smp
Solo	Concerto – Mvt. 2 Single Line –2 (mm...	Taylor2–Single Line 2.smp
Solo	Concerto – Mvt. 2 Single Line (mm. 2...	Taylor2–Single Line.smp

Figure 21. Accessing *Finale Created Files* database

Instrumentation

Set Intelligent Accomp
Set Wait For Note
Set Cuts
Set Breath Mark
Remember Tempos
Set Tempo Mark
Instrumentation
Skip Over Rests
Repeats
Fine Adjustments
Open/Save Customs

Percussion 2
Percussion 3
Percussion 4
√ Violin I
√ Violin II
√ Viola
√ Violoncello
√ Contrabass

Instrumentation determines the instruments used in the accompaniment for your piece. Specific instrumentation options vary with the piece you play. Some pieces, mostly classical, allow you to select the solo line along with piano or ensemble accompaniments (basso continuo or arrangement); while others, mostly jazz, pop, etc., allow you to select specific accompaniment instruments (i.e., piano, bass, drums, etc.).

To set the instrumentation, select the instruments you wish to hear.

Help

Figure 22. Setting Instrumentation to strings only for rehearsing mm. 12–20

In coordination with the Ensemble Accompaniment feature, SmartMusic provided a Practice Loop function that allowed the user to set the beginning and ending measures of a practice section to which SmartMusic would count off and repeat. To set the beginning of the Practice Loop, the user set the From Rehearsal Mark beginning at m. 12/beat 1. To set the end of the Practice Loop, the marimbist set the Thru Rehearsal Mark for m. 32/beat 4. The marimbist utilized the 1 Bar Countoff feature that produced four quarter note clicks before the rehearsal section began. The 1Bar Countoff provided the tempo for the rehearsal section and allowed the marimbist one measure to mentally prepare before rehearsing. One measure was added at the end of the practice section to reset the loop (fig. 23).

Figure 23. Practice Loop setup screen for Movement I

Chapter V is a summary of the document. Conclusions, program deficiencies, and suggestions for further research are provided.

CHAPTER V

CONCLUSIONS, SUGGESTIONS, AND RECOMMENDATIONS

FOR FURTHER STUDY

Conclusions

The purpose of the study was to investigate the features of three interactive music

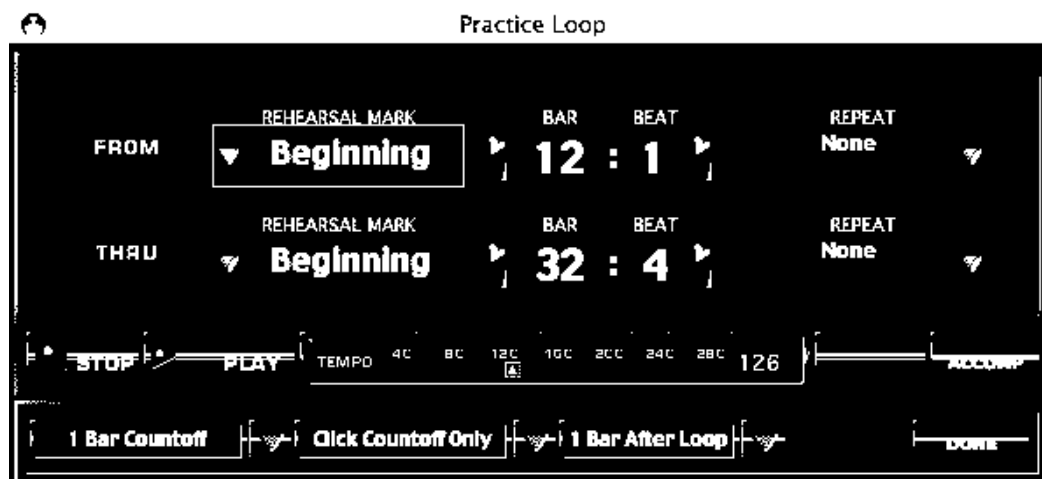software programs and their application in preparing marimba concerti. Finale 2009 and

NOTION 2.0 provided realistic instrument sounds, real-time tempo control, and

instrument isolation thus enabling both programs to function as viable alternatives to

piano accompaniments in the preparation of marimba concerti. Both programs provided

comparable instrument sounds in terms of quantity and quality. Both programs provided

real-time tempo adjustment features and mechanisms for instrument isolation. In

addition, both programs provided limited practice loop functionality. All of these features

provided a means for students and performers to develop ensemble performance skills

while preparing a marimba concerto —balance and blend, rubato, conducting through

gestures, and rhythmic precision. SmartMusic provided comparable instrument sounds in

terms of quantity and quality. Per the manufacturer's admission, however, the program's

real-time accompaniment feature did not work properly with keyboard percussion.

SmartMusic provided a mechanism for instrument isolation, as well as an advanced

practice loop feature that was useful in preparing marimba concerti.

Finale 2009

      Finale produced comparable orchestral instrument sounds using its SmartMusic SoftSynth device. Using the *Garritan Instruments* for playback provided more sampled instrument sounds to apply to the *Concerto No. 1 in D Minor for Marimba and Orchestra* files, thus producing more realistic orchestral instrument sounds. Greater sound quality could have been gained if effort had been taken in mapping out the score to specific samples. Score mapping, however, was beyond the scope of this study. In addition, Finale's ability to access third-party sound libraries via Virtual Studio Technology (VST) and Audio Unit (AU) technology provided an expandable quality that the other programs did not offer. The VST/AU functionality provided by Finale offered almost limitless sound quality possibilities and provided users with the flexibility to tailor the playback of Finale to their specifications.

      Although not designed as a real-time tempo adjustment tool, Finale's Tempo Tap mechanism functioned appropriately in such a capacity. The mechanism provided a means to manually record tempo changes into a score. Yet the functionality of the feature allowed the Tempo Tap mechanism to provide real-time tempo adjustments without incident. Although adjusting the rhythm in the Tempo Tap measures from the default quarter notes to triplet eighth-note rhythms took time, eventually the user understood the process and navigated with few delays. One concern experienced during Tempo Tap performances was the pace at which the screen advanced delayed to the last beat of the last measure on the screen. This made following the Tempo Tap rhythm complicated since the measure on the next screen was not viewable until that measure was active.

Finale's Audio Mixer feature offered two access methods and two means of isolating instruments. The simple functionality provided optimum results for selecting specific instruments with which to rehearse and solidify rhythmic accuracy. In addition, the Playback Controls mechanism provided features that aided in making rehearsals efficient and effective.

NOTION 2.0

NOTION's bundled instrument sounds provided realistic sound quality and a sufficient quantity of instruments. Although saxophones were omitted from the bundled sound library, they were not needed in this concerto. The Expanded Sound Kits completed the orchestral sounds at a moderate cost. The additional sound kits added instruments and techniques that increased sound quality and instrument quantity. Since NOTION did not offer VST/AU expandability, the sound kits were the only means by which the quality and/or quantity of instrument sounds could be augmented.

NOTION's NTempo feature provided functional, real-time tempo adjustment control via an additional person. Entering notes in the NTempo Staff was achievable with minimal commands and allowed the user to tailor the accompaniment rhythms to the preferences of the accompanist. In addition, NOTION provided the user with the ability to show or hide staves and adjust the order of staves in the score. When utilizing the NTempo feature in rehearsing the second movement of *Concerto No. 1 in D Minor*, rearranging the score order was a useful tool. Because the solo marimba part and the NTempo staff rhythms were similar, the accompanist preferred to have the solo marimba

part just below the NTempo staff. In the score setup menu, the marimba staff was moved

to just below the NTempo staff to accommodate the accompanist's preferences. Finally, it

was possible to record the performance as a playback file. This feature was useful to

demonstrate to an accompanist how a soloist wanted to execute a ritardando or

accelerando.

NOTION isolated instruments via its Audio Mixer feature. The Audio Mixer

provided two methods of isolating instruments —muting and soloing. Marking the

desired instruments as solo instruments was the most efficient and effective way to

isolate instruments and aid in solidifying the concept of ensemble rhythmic accuracy. In

addition, utilizing the Go To feature, Escape key, and Play button created a quasi practice

loop. This service assisted in preparing marimba concerti, particularly building proper

practice habits.

SmartMusic

SmartMusic produced applicable instrument sounds via the SmartMusic

SoftSynth device. The 128 General MIDI sounds were sampled sounds that provided a

basic library of orchestral instrument realizations. The program's lack of expandability

limited the quality and quantity of instrument sounds available to the user.

Although MakeMusic, Inc. indicated that keyboard percussion was not

compatible with SmartMusic's Intelligent Accompaniment feature, several attempts to

make the mechanism work were made. Adjustments were made to the solo marimba part

and the Intelligent Accompaniment settings; however, the feature did not work properly with marimba.

By exporting a Finale file to SmartMusic as an Ensemble Accompaniment, SmartMusic was able to provide instrument isolation as the user desired. Through the Practice Loop device, the user was able to isolate instruments, adjust rehearsal tempi, set practice loop measures, and establish beginning and ending countoff and reset parameters.

Suggestions

Finale and NOTION worked well in both an individual practice setting and performance studies lesson settings. In individual practice sessions, the user set the programs to function as recorded accompaniments. Although the programs were "performing" the tempo changes that the user had defined, the performer was playing to the track instead of the track following the performer. This arrangement had limited appeal, but it provided tangible pedagogical benefits—full orchestral accompaniments, practice loop functionality, and the ability to practice with isolated instruments. In performance study lessons, with the performance studies teacher operating the NTempo or Tempo Tap feature, the programs functioned as accompaniment tools and followed the performer through the performance. In addition, the teacher was able to initiate and demonstrate interpretation suggestions to the student. The interactive quality that Finale and NOTION provided was beneficial to marimba concerto preparation.

Entering notes, articulations, dynamics, and miscellaneous entries for a three-movement concerto was a time-consuming process. Therefore, importing concerto files using Music Extensible Markup Language (MusicXML) was recommended. MusicXML import was the quickest and most accurate way to enter the score into Finale and NOTION. If a MusicXML file was not available, scanning the score into the programs was a viable alternative. Although the scanning technology was not 100% accurate, the programs were a time saver over entering the concerto by hand.

<p style="text-align:center">Recommendations for Further Study</p>

Further research studying the effects of interactive music software on marimba concerto preparation is recommended. Empirical studies examining the benefits of interactive music software programs on the preparation of marimba concerti would further develop the current study. Earlier studies performed on the interactive music software program Vivace® should be duplicated and/or adjusted for current, more stable technology. In addition, similar descriptive and/or empirical studies could be expanded to include percussion chamber works, and marimba concerti for marimba and wind ensemble, marimba and percussion ensemble, and marimba and chamber ensemble.

Studies examining the preparation of percussion orchestral excerpts would be beneficial. Students and performers prepare excerpts in private practice, by practicing to recordings of orchestral performances of the excerpt, or by performing to compact disc recordings of select orchestral accompaniments minus the solo percussion part. Descriptive and /or empirical studies the adaptability of interactive music software

programs in the preparation of percussion orchestral excerpts, or examining the benefits of interactive music software programs in the preparation of percussion orchestral excerpts would be constructive.

Future versions of NOTION and Finale require that this subject be revisited in the near future. Finale 2010 begins shipping to consumers in June 2010. New and updated features include simplified percussion notation, over 350 Garritan instrument sounds, improved VST/AU support and an updated Aria® player. NOTION 3.0 is scheduled for release in 2010 and will accommodate Virtual Studio Technology Instruments (VSTi) and provide MIDI out functionality for exporting files. Also, NOTION 3.0 will offer "enhanced compatibility with other programs and libraries and will have improved live performance features."[25] Advancements in NOTION and Finale might significantly improve the program deficiencies noted previously.

If further studies determine significant benefits to preparing marimba concerti using interactive music software programs, music publishers should be made aware so they could make MusicXML files available for import. This would greatly reduce the preparation time required to input a full orchestral score. Another solution to inputting orchestral accompaniments by hand would be for publishers of marimba concerti to offer XML or MIDI files of the orchestral accompaniments for purchase. Reducing the complexity of entering the orchestral accompaniments to marimba concerti might

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[25] Jim Boitnott (President/CEO, NOTION Music, Inc.), in discussion with the author, May 2009.

encourage performers to perform new concerti, as well as assist students and performers with preparing for competitions and performances.

Although marimbists traditionally rehearse marimba concertos with accompanists performing piano reductions, a need for a practice tool that more realistically reproduced the orchestral accompaniment was lacking. Interactive music software programs such as Finale, NOTION, and SmartMusic provided features to assist students and performers in the preparation of marimba concertos. In addition, future versions of interactive music software programs will likely offer new and improved features to aid students and performers with preparing marimba concertos as well as solidifying ensemble performance concepts.

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Appendix A

MakeMusic Permission Approval Form

makemusic®

7615 Golden Triangle Drive, Suite M
Eden Prairie, MN 55344
http://www.smartmusic.com/

Danny Frye
High Point University
833 Montlieu Avenue
High Point, NC 27262

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Thank you,

David Hawley
SmartMusic Product Specialist

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Appendix B

NOTION Permission Approval Email

From: "Jim Boitnott" <jim@notionmusic.com>
Date: May 24, 2009 5:03:11 PM EDT
To: "Danny Frye" <dannyfrye@earthlink.net>
Subject: RE: Copyright Permission Request

danny...sorry I did not respond to this sooner...just got back in the country. You are good to go on using whatever you need.

Danny Frye has the permission of NOTION Music to use screen shots, information found in our documents, on our website, or product packaging for his dissertation.

Jim Boitnott
President/CEO
NOTION Music

Appendix C

MIDI Manufacturers Association Permission Email

From: info@midi.org
Subject: RE: Form Generated Email from www.midi.org
Date: June 9, 2009 6:00:02 PM EDT
To: dannyfrye@earthlink.net

Thank you for completing our form.

Because you will be taking the list of instruments and putting that into your own table (rather than using our presentation of that data) you do not need our permission.

We will keep your form and this email in our files.

Regards,

Tom White
MMA